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AUTHOR Guerrero, Frank; Eisler, Judith
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ABSTRACT

This evaluation focused on staff development activities in mathematics, science, and computer science in New York City schools during 1985-86. Workshops for mathematics teachers and supervisors were designed to help participants implement new curricular mandates. Participants rated the training positively and felt it would be useful and had prepared them to assist peers. Follow-up training provided help in lesson and homework planning and test development; again reactions were positive. Science workshops providing an overview of specific science curricula and teaching and classroom management techniques were rated highly. Eight courses focused on the elementary science curriculum, emphasizing a hands-on, discovery approach. Workshops were also given on new science curricula for high school science supervisors, including training on the evaluation and use of computer software. Most participants considered the training appropriate, but the follow-up requirement was not well understood or not feasible. Use of the Gateway Environmental Study Center was noted, plus provision for hiring science coordinators or laboratory specialists. Workshops on computers, a computer conference on latest trends, and training on computer equipment maintenance were provided, with positive reactions. Five recommendations are included. (MNS)

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Staff Development Program in
Mathematics, Science,
and Computer Science
Evaluation Report
1985-86

OEA Evaluation Report

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EVALUATION SECTION

Robert Tobias, Administrator
John Schoener, Senior Manager

FINAL REPORT
DECEMBER, 1986

Staff Development Program in Mathematics, Science, and Computer Science Evaluation Report 1985-86

Charlotte Frank,
Executive Director
Division of Curriculum
and Instruction

Kenneth Bates, Director
Office of Finance and
Management

Anthony Galitsis,
Director of Science
Susan Zakaluk,
Director of Mathematics

Irwin Kaufman, Director
Office of Technology

Prepared by:
Instructional Support Evaluation Unit
Frank Guerrero, Unit Manager
Judith Eisler, Evaluation Project Manager

New York City Board of Education
Office of Educational Assessment
Richard Guttenberg, Director

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SUMMARY

The Staff Development Program in Mathematics, Science, and Computer Science is administered by the Division of Curriculum and Instruction. The program aims to improve the quality of mathematics, science, and computer instruction in the city's schools.

The 1985-86 program goals were:

- to assist teachers in upgrading their subject area knowledge and instructional skills;
- to offer training in understanding and teaching new curricula;
- to help administrators and supervisors in providing management and instructional support to other school staff; and
- to provide updated curriculum materials. (All units continued to develop and distribute materials.)

The evaluation focused on the staff development activities conducted by the program's three units: the Mathematics Unit, Science Unit, and the Computer and Information Sciences Unit. While the units had the same general goals, they each implemented discrete activities that were consistent with their specific objectives. Overall, these objectives were successfully met.

More than 1,800 mathematics teachers and supervisors attended workshops offered by the Mathematics Unit in summer, 1985. Training focused on helping participants to understand and implement new curriculum mandates. Participants rated the training positively and anticipated that it would be useful in fulfilling their responsibilities during the 1985-86 school year. They believed, too, that the workshops had adequately prepared them to assist their peers in "turnkey" fashion, a role they were expected to assume.

Follow-up training in mathematics was offered in spring, 1986 at satellite centers located in all boroughs. It focused on providing practical help in lesson and homework planning, and test development. Participants generally agreed that the course objectives were met, and expressed the opinion that the training was appropriately geared to their previous background in mathematics.

In summer, 1985 the Science Unit conducted workshops attended by over 1,350 school and district personnel. The workshops were designed to provide participants with an overview of specific science curricula and to present practical teaching and class management techniques. Participants rated the overall quality of the training highly, and anticipated that it would be useful in meeting their teaching or supervisory responsibilities. Most trainees expected to participate in some follow-up activity.

Eight in-service courses focusing on the elementary science curriculum were offered during spring, 1986. They emphasized a hands-on, discovery approach to teaching science. The instructors, in turnkey fashion, were staff developers who had participated in summer, 1985 workshops. Also offered in spring, 1986 were workshops on various new science curricula for high school science supervisors, and training in the evaluation and use of computer software for science education. Over 200 participants attended these staff development activities. Most considered the training to be appropriate to their needs. However, the follow-up requirement was not well understood or not feasible, since less than one-third of those who took courses in which there was such an expectation intended to fulfill it.

In addition, approximately 1,500 school staff and 16,000 students made use of the Gateway Environmental Study Center, which provides a wide range of environmental education programs. Staff development for teachers included field trip orientations, environmental arts workshops, and help in relating field experiences to the New York City science curriculum.

The Science Unit also provided funds to community school districts (on a matching basis) to hire science coordinators and/or laboratory specialists. Their responsibilities included providing staff development support to teachers and supervisors.

According to the Computer and Information Sciences Unit (C.I.S.U.), the five Technical Assistance Centers (TACs) provided a total of 581 staff development workshops for 8,480 participants during summer, 1985 and the 1985-86 school year. The TACs also assisted parents, community school boards, administrators, and other school personnel with various other computer-related needs, often upon request.

A computer conference, designed to acquaint school district personnel with the latest trends in computer technology and their applications, and a series of workshops for school personnel on basic computer equipment maintenance and repair, were attended by 100 and 241 people, respectively. Participants of both training activities judged them to be highly successful.

The W.E. Grady High School Computer Repair Program, a pilot project, provided computer repair training and instruction in electronics to eight students, and computer repair service to four high schools in addition to Grady. Participating students were enthusiastic about the program and said that their training was practical and up-to-date.

Based on the evaluation findings, the following recommendations are made:

- When follow-up responsibilities are part of a staff development activity, participants should be apprised of this requirement and commitments secured from school administrators (particularly where they are involved in the selection of participants) to provide the support necessary for the implementation of these responsibilities.

- Assistance in more effectively using time, and pacing the instruction provided, should be given to instructors of staff development activities.

- Consideration should be given to expanding the summer staff development workshops, particularly to provide for more comprehensive coverage of new curriculum topics and, where appropriate, hands-on experiences.

- Subsequent training should be provided to participants of summer staff development workshops throughout the school year, tailored specifically to their continuing needs.

- Consideration should be given to using videotapes of exemplary sessions to extend the benefits of summer training to those who did not participate in the summer activities.

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I. INTRODUCTION

PROGRAM BACKGROUND

The Staff Development Program in Mathematics, Science, and Computer Science was initiated in summer, 1982 by the Division of Curriculum and Instruction (C. and I.) with funds provided by the New York City Council. Its overall goal is to improve the quality of mathematics, science, and computer science education in New York City's public schools. To this end, it provides staff training and curriculum development support to teachers, staff developers, supervisors, and administrators at all grade levels. Assistance has been given in many areas -- e.g., using effective instructional and management techniques, understanding and implementing new curriculum mandates, developing computer literacy, and using computers as educational tools.

Courses and workshops have been offered at a variety of sites, including the central Board of Education, district offices, schools, satellite centers, and in collaboration with colleges and universities throughout the metropolitan area, sometimes for in-service or college credit. A key feature of some program activities has been the concept of turnkey training by which program participants are expected to share the benefits of their staff development experiences with their colleagues. This has ranged from introducing new curricula at grade and faculty conferences to teaching in-service science courses.

PROGRAM GOALS

Although C. and I.'s Mathematics Unit, Science Unit, and Computer and Information Sciences Unit each designed and administered discrete program activities, they had several common goals. These were:

-- to assist teachers in upgrading their subject area knowledge and instructional skills;

-- to offer training in understanding and teaching new curricula;

-- to help administrators and supervisors in providing management and instructional support to other school staff; and

-- to provide updated curriculum materials.

SCOPE OF THE EVALUATION

The evaluation focused on the major staff development activities conducted by each of the three units during summer, 1985 and the 1985-86 school year. In addition, the Office of Educational Assessment/Instructional Support Evaluation Unit reviewed other activities related to the achievement of overall program goals, such as curriculum development and the provision of funds for additional personnel and supplies.

EVALUATION PROCEDURES

The O.E.A./I.S.E.U. used the following data sources in evaluating the Mathematics, Science, and Computer Science Staff Development Program:

- C. and I. memoranda announcing the program and describing its major goals, activities, and selection criteria.
- Project documents: accounts of curriculum development and distribution; budget summaries of supply and equipment expenditures (in some instances provided by other Board of Education offices); and status reports documenting Technical Assistance Center (TAC) activities.
- Interviews conducted by O.E.A. staff with unit directors and other key program staff regarding project objectives, activities, accomplishments, problems encountered, and future plans.
- Reaction forms distributed to participants of staff development activities asking them about the quality and usefulness of the training, anticipated participation in follow-up activities, and suggestions for future activities.

- Interviews with a stratified sample of science coordinators and laboratory specialists about their respective roles and responsibilities in promoting science education.

- Observations by O.E.A. staff of a selected number of summer, 1985 mathematics staff development workshop sessions.

- Records of the Bureau of Staff Development and Training regarding in-service science course offerings and participants.

SCOPE OF THIS REPORT

This report of the 1985-86 Mathematics, Science, and Computer Science Staff Development Program consists of four chapters. Chapter I describes the program background, scope of the evaluation, and evaluation procedures. Chapter II provides an overview of the major activities of each unit. Findings are presented in Chapter III. Conclusions and recommendations are included in Chapter IV.

II. PROJECT OVERVIEW

MATHEMATICS

Summer, 1985 Staff Training

Nearly 1,840 mathematics supervisors, teachers, and special education personnel from all grade levels attended workshops during August, 1985. Community school district and local school administrators selected participants. The workshops focused upon the trainees' teaching or supervising responsibilities regarding specific mathematics curricula, and dealt with both practical and theoretical issues. Participants of most courses were expected to engage in some follow-up activity during the 1985-86 school year, such as piloting the new mathematics curriculum introduced at the workshop they attended, or providing turnkey training for their peers.

School Year 1985-86 Staff Training

Follow-up training was offered at satellite centers located in all boroughs during spring, 1986, primarily for participants of the summer, 1985 workshops. The training focused on helping elementary and high school teachers and supervisors to implement new curriculum requirements and to improve the teaching of mathematics through lesson planning, homework planning, and testing. More than 600 public school personnel attended these staff development activities.

Curriculum Development and Distribution

In order to meet the new mathematics requirement of the Regents Action Plan, the Mathematics Unit continued to develop and distribute scope and sequences or curriculum guides for the following courses of study: Second

Year Consumer Mathematics; Sequential Mathematics, II and III; High School Computer Mathematics; and Elementary Mathematics (grades two to four).

Mathematics and Science Equipment and Supplies for High Schools

During the school year 1985-86, $1.1 million was spent to equip three redesigned high schools intended to become theme-based magnet schools, to purchase textbooks for the new Sequential Mathematics curriculum in all New York City high schools, and to expand the Comprehensive Mathematics and Science Program in nine New York City high schools in order to attract minority students to the engineering profession. (These schools offer technical training in collaboration with engineering departments of some local colleges.)

SCIENCE

Summer, 1985 Staff Training

During August, 1985, over 1,350 staff developers, supervisors, and teachers of elementary, intermediate/junior high, and senior high school science programs attended staff development workshops. The training was designed to familiarize participants with specific science curricula and to present practical techniques for teaching them. District and school administrators selected staff participants.

To extend the benefits of this training to other school personnel, most participants were expected to engage in some follow-up activity during the 1985-86 school year: to teach (with pay) an in-service science course to other teachers in their district; to provide district-based workshops or informal staff development assistance to their colleagues; and, for those

who received training in a new science curriculum, to pilot the curriculum and provide feedback about their experience.

School Year 1985-86 Staff Training

In-Service Courses. Eight in-service courses focusing on the elementary (kindergarten to grade six) science curriculum were offered during spring, 1986.* They emphasized the use of hands-on activities and the discovery approach of science education. A primary objective was to help teachers design and implement activity-oriented lessons which, by example, help children to understand that science is a process for solving problems and not simply a series of facts to be mastered. The instructors, in turnkey fashion, were staff developers who had participated in the summer 1985 workshops; all had approval from the Bureau of Staff Development and Training (B.S.D.T.), the office within the Division of Personnel that oversees in-service training for Board of Education staff.

Spring, 1986 Workshops. Other staff development activities conducted during spring, 1986 included workshops for teachers and supervisors of the elementary science program, the new seventh grade life science curriculum, and the new eighth grade Regents earth science course of study; and a workshop for high school science supervisors on evaluating and using computer software for science education. Some of these courses were designed as follow-up activities for participants of summer, 1985 staff development programs; others were specifically intended to assist newer or

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*The actual number of participants was not available as of August 22, 1986 when these data were collected because instructors for four of the eight courses had not provided the requested attendance data to the Bureau of Staff Development and Training. Based on the available attendance data, however, it was estimated that 80 people attended these courses.

out-of-license teachers. In addition, some workshops were conducted by the Science Unit of the Division of Curriculum and Instruction, while others were provided by community school districts with support from Science Unit staff.

A total of 120 public school science personnel participated in these activities. All participants were paid at the contractual rate of $10 per hour.

Other Science Activities

Gateway Environmental Study Center. In 1972, 26,000 acres of New York and New Jersey woodlands, grassy fields, beaches, and freshwater ponds were designated by an Act of Congress as the Gateway National Recreation Area -- so named because its two arms of land stretch across Jamaica Bay to form a natural gateway to the port through which millions of immigrants have come to America's shores. Recognizing the educational potential of this rich parkland, the National Park Service of the U.S. Department of the Interior and the New York City Board of Education established the Gateway Environmental Study Center which, through its numerous staff development and field activities, serves as a dynamic outdoor classroom.

The study center's full-time coordinator works in collaboration with Gateway National Park personnel, the Board of Education, and a network of other individuals and organizations to provide a wide range of environmental education programs and related resource materials for New York City public school personnel. A major focus of many staff development workshops is not only to prepare teachers for class visits to Gateway, but to help

them relate these experiences to the New York City science curriculum through pre- and post-visit student activities.

Another way in which Gateway builds a bridge between its outdoor programs and science education is the involvement of teachers in the writing of related curriculum materials, including trail guides to frequently visited Gateway study areas. More than 18,000 public school personnel and students participated in Gateway activities during the 1985-86 school year.

Science Coordinators/Laboratory Specialists. In order to strengthen elementary and junior high science education, each community school district was allotted $18,000 to hire a science coordinator and/or laboratory specialist(s).* Most districts (28 out of 32) used the monies for the science coordinator position; the remaining four districts hired one or two laboratory specialists.

Science coordinators were expected to provide staff development support for teachers and supervisors in both elementary and junior high schools, to assist district schools in selecting and distributing instructional materials, and to coordinate other science activities -- e.g., the district-wide science fair and school field trips.

The responsibilities of the laboratory specialist, which extended only to junior high schools, were to assist teachers with laboratory experiments, to order science supplies, and conduct safety evaluations of laboratory equipment and materials. Unlike the science coordinators, however, they were based in the schools rather than the district, and were expected to provide services to only one or two schools.

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*The districts provided matching funds.

Curriculum Development and Distribution

The Science Unit continued to develop, revise, and, in some cases, distribute scope and sequences for elementary science (kindergarten to grade six), life science (grade seven), and earth science (grade eight). These instructional materials were intended to assist science personnel in satisfying the new mandates of the Regents Action Plan.

COMPUTER SCIENCE

Technical Assistance Center (TAC) Staff Development Activities

Technical Assistance Centers located in all five boroughs provided support services in computer education to public school personnel. Over 150 computer education courses were offered to all school-based personnel at more than sixty locations. The TACs assisted in the selection of hardware and educational software, and offered training in the use of computers for classroom instruction as well as a wide variety of administrative applications. In addition, the TACs maintained computer libraries of software and computer-related resource materials, and participated in the development of curriculum guides. In collaboration with local colleges universities, they also offered certificate and masters degree programs in computer education.

Computer Conference for Community School Districts

In March, 1986, 100 community school district superintendents, computer coordinators, and curriculum coordinators attended a two-day conference in Suffern, New York. Its purpose was to acquaint participants with the latest trends in computer technology and their educational and administrative applications.

A wide variety of workshop presentations, hands-on demonstrations, and panel discussions provided opportunities to learn about innovative computer programs and ways of integrating them with traditional curriculum areas -- e.g., using an electronic encyclopedia, creating school publications including graphics, and using robotics to promote thinking skills. Other topics included criteria for selecting hardware and software, and technical issues such as adequate electrification for computer installation and the security and repair of equipment.

Workshops on Microcomputer Preventive Maintenance and Repair

Approximately 400 community school district and high school personnel attended one-day workshops designed to familiarize them with computer system functioning, maintenance, and troubleshooting procedures. The workshops, which were held at TACs in four boroughs, emphasized basic preventive maintenance procedures and identifying the nature and extent of system malfunctions. Participants were provided with a guide, videotape, diagnostic diskette and disk drive cleaning kit, and were expected to act as school facilitators by sharing the benefits of this staff development experience with their colleagues at faculty and departmental meetings.

W.E. Grady Computer Repair Center

In May, 1986, the Office of Media and Telecommunications implemented a pilot student computer repair program at W.E. Grady High School.* The major purposes of this pilot program are:

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*Problems related to equipping and securing the computer repair room, and training and hiring staff, delayed the start of the program, originally planned for February, 1986.

- to develop students' skills and knowledge in the repair of electronic and electro-mechanical devices, and personal computers and peripherals;

- to provide computer repair service to several New York City high schools participating in the Municipal Assistance Corporation/Vocational Improvement Program (MAC/VIP) computer education program;* and

- to develop and pilot a computer repair and maintenance curriculum for use at computer repair centers to be established at other vocational school sites.

During May and June, 1986, eight Grady students participated in the program. They were selected on the basis of their overall achievement and their interest in electronics and computer technology. Instruction, which took place two periods a day, five days a week, consisted of hands-on experience and training in electronics theory, and utilized a problem-solving approach. (Actual repairs of the MAC/VIP computer laboratory equipment were made by the Center's computer technician since students were not ready to do so this school year.) The technician, whose primary responsibility was to service the MAC/VIP schools, also served as an advisor to the instructor and program director -- e.g., providing information about the most common computer problems students are likely to face.

The program plans to continue to operate the Grady Repair Center during the 1986-87 school year and, based on that experience, to replicate the model in four to five other vocational schools in the other boroughs.

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*The MAC/VIP Program, implemented during the 1985-86 school year in approximately 100 high schools, provides computers, technical assistance, and staff development support; its purpose is to promote computer education and the integration of computers in subject area instruction.

Curriculum Development and Distribution

The Computer and Information Sciences Unit developed or revised ten curriculum bulletins during the 1985-86 school year. These were distributed to high school and community school district personnel in conjunction with staff development activities conducted by the Technical Assistance Centers.

III. FINDINGS

MATHEMATICS STAFF DEVELOPMENT, SUMMER, 1985

Participants' Assessment of Training

Questionnaires were distributed to all participants (N=1,836) of the summer, 1985 Staff Development Program in Mathematics at the conclusion of workshop sessions. A total of 1,267 participants completed questionnaires, representing a response rate of 69 percent. This is an acceptable response rate for questionnaires administered under these circumstances.

Of those respondents who attended courses for teachers (N=1,085), nearly three-quarters (72 percent) reported having seven or more years of teaching experience. Participants of supervisors' workshops (N=142) generally had less experience in their supervisory position -- only 40 percent reported serving in this capacity for seven or more years. Similarly, most (60 percent) of the special education personnel who participated in courses designed for them had less than seven years' teaching or supervisory experience in this field.

Asked to assess their background in mathematics, a majority of participants of all workshops (62 to 92 percent)* said "good" or "excellent." Trainees in workshops on teaching or supervising computer mathematics curricula were asked to rate their facility in using computers for educational purposes prior to their participation in this summer training program. Teachers were evenly divided in their responses: half said "poor"

*Since the various mathematics workshops had different objectives and were designed for different participant groups, separate questionnaires were developed for each workshop. The data were analyzed and presented by workshop to program staff, to meet specific planning needs. Presented here is a summary of major findings across all workshops.

or "fair" and half said "excellent" or "good"; supervisors reported a higher level of comptetency (80 percent gave positive self-ratings).

Despite these differences in their backgrounds, large majorities of participants (70-96 percent) across all workshops said that the training they received was appropriate to their previous teaching or supervisory experience and math background, and they anticipated that it would be useful in view of their school responsibilities. In response to questions asking about more specific aspects of the training, most (74-100 percent) of the trainees agreed that the workshops they attended adequately reviewed new curriculum topics, provided sufficient opportunities for sharing ideas and, where applicable, provided enough opportunities for hands-on experiences. They indicated, too, that the workshops adequately prepared them to serve as turnkey trainers, a role they were expected to assume during the 1985-86 school year.

Participants' ratings of course instructors were similarly positive: 90 percent or more of the respondents across all workshops judged the trainers to be "excellent" or "good" with regard to their knowledge of the curriculum taught, presentation of the subject matter, responsiveness to questions, and their use of instructional materials.

Since each workshop was designed to meet the staff development needs of discrete groups of school personnel -- e.g., high school teachers of computer math, elementary level supervisors, special education teachers and supervisors -- trainees were also asked to assess the quality of assistance provided on the topics specific to the workshop they attended. That a majority (51 to 97 percent) of the respondents across all workshops rated the assistance as "excellent" or "good" indicates that the summer, 1985

training program was largely successful in providing support in the specific ways intended.

Moreover, approximately half (43-60 percent) of the trainees across all workshops indicated that they intended to participate in some kind of follow-up activity during the 1985-86 school year -- providing assistance to their colleagues or piloting the new mathematics curriculum in which they were trained.

Observers' Assessment of Training

O.E.A. staff observed seven of the ten mathematics staff development workshops offered in summer, 1985. One session of each workshop was observed, except for the grade level workshops for elementary school teachers; for these workshops, two of the five grade levels were observed.

Observers rated the extent to which they agreed with 16 positive statements about various aspects of the training, using a four-point scale in which four represented the highest rating and one the lowest.* Overall, their assessment of the summer training was positive, although they judged it to be more successful in some respects than others (Table 1).

The training was rated most highly with respect to the following: instructor's responsiveness to participants' questions and comments; instructor's knowledge of the topics; availability of instructional materials; emphasis on practical issues; and opportunities for class discussion.

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*The actual scale positions presented in the questionnaire were reversed; however, for purposes of consistency with the rest of this report they have been inverted and the means reported in Table 1 adjusted accordingly.

TABLE 1

Observers' Assessment of Summer, 1985 Mathematics Training

Aspects of Training	Rating	
	Mean	S.D.
Content relevant to teaching/ supervisory needs	3.0	0.6
Sufficient opportunity for class discussion	3.1	0.9
Session well organized	2.4	1.0
Subject matter clearly presented	3.0	1.0
Instructor responsive to questions and comments	3.6	0.5
Class size appropriate	2.9	1.1
Good use of instructional materials	2.6	1.0
Class participation encouraged	3.0	0.8
Overall quality of instruction high	2.7	0.8
Instructor knowledgeable about topic	3.6	0.5
Participants' level of interest high	2.9	0.7
Pacing of instruction appropriate	2.3	1.0
Amount of time sufficient to meet objectives	2.3	1.2
Training geared to level of experience	3.0	0.6
Instructional materials adequately available	3.6	0.5
Sufficient emphasis on practical issues	3.4	0.8

Rating Scale: 1 = Strongly disagree; 2 = Moderately disagree
3 = Moderately agree; 4 = Strongly agree

- Overall, observers' ratings of mathematics workshops were positive. The four aspects rated most highly were the instructors'responsiveness to questions and knowledge of the topic, the availability of instructional materials, and the emphasis placed on practical issues. The pacing of instruction, time alloted for sessions, and the level of organization were rated less positively than other aspects.

According to the observers, the weakest aspects of the summer, 1985 mathematics training were the allocation of time to meet session objectives, the pacing of instruction, and the level of organization.

Additional comments offered by the observers indicated that some instructors spent an inordinate amount of time on administrative matters, minute details, and anecdotes. They believed this time could have been better spent on substantive instructional issues. Inadequate planning on the part of a few instructors resulted in an improper balance between discussions of theoretical and practical issues, and the failure, in some instances, to meet all session objectives. Overall, the quality of the sessions, in the opinion of the observers, was more dependent upon adequate planning and organization on the part of the instructor than on the course content (which was perceived largely as being relevant to the needs of the trainees) or on the instructors' knowledge of the subject matter.

Based on these findings, the Mathematics Unit has initiated plans for 1986-87 staff development activities that include grouping participants with common needs and interests, and providing course instructors with a Scope and Content which includes specific directives for each subsection.

MATHEMATICS STAFF DEVELOPMENT, SPRING, 1986

More than 600 public school personnel attended mathematics courses held during spring, 1986 at satellite centers located in all five boroughs. Questionnaires, distributed to all participants at the conclusions of the sessions, focused on participants' assessment of the quality and usefulness of the instruction provided, suggestions for improvement, and continuing staff development needs.

A total of 467 questionnaires, representing a response rate of 75 percent, were returned. The vast majority of respondents were teachers (87 percent); the rest were supervisors (three percent) and other school personnel (10 percent) such as math coordinators and staff developers. Most (85 percent) participated in courses dealing with an elementary level mathematics curriculum;* the remainder received instruction in the Sequential Mathematics or Computer Mathematics curriculum.

Overall, these respondents had a considerable amount of classroom teaching experience -- i.e., close to two-thirds reported having taught for more than seven years. In addition, a majority (80 percent) of the satellite course respondents rated their math background as "good" or "excellent."

Although each course had objectives that were specifically related to the particular curriculum it covered, they all had several common objectives. In assessing the extent to which these shared objectives were met, large majorities of trainees (ranging from 88 to 97 percent) agreed that the workshop they attended provided assistance in each of five areas that the Mathematics Unit director identified as the major aims of these staff development activities (Table 2). Evaluations of course instructors were similarly positive. The vast majority of respondents (ranging from 88 to 97 percent) rated those who taught the course they attended "good" or "excellent" with regard both to their knowledge of the curriculum area and various aspects of their instructional approach (Table 3). Most participants (about 85 percent) said that the training was "very" or "moderately" appropriate considering their previous mathematics background and anticipa-

ted that it would be useful in light of their teaching or supervisory responsibilities.

In response to several open-ended questions, participants identified the most valuable dimensions of the mathematics satellite course they took,

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*Instruction in the elementary mathematics curriculum (grades two through six) was separated by grade level.

TABLE 2

Participants' Assessment of Extent to which Spring, 1986 Mathematics Satellite Course Objectives Were Met

Objective	Rating			
	Disagree Strongly	Disagree Somewhat	Agree Somewhat	Agree Strongly
Presented useful teaching methodologies	1%	4%	38%	57%
Provided assistance in developing well-constructed tests	3	10	48	40
Provided sufficient opportunities for sharing ideas	1	3	24	73
Offered help in planning effective homework assignments	1	5	39	54
Provided assistance in developing appropriate lessons	2	8	42	48

- Large majorities (88 to 97 percent) of mathematics trainees agreed that the satellite course objectives were met.

TABLE 3

Participants' Ratings of Satellite Mathematics Course Instructors

Dimension	Rating			
	Poor	Fair	Good	Excellent
Knowledge of curriculum topics covered	0%	5%	25%	70%
Presentation of subject matter	2	10	29	59
Responsiveness to participant's questions	0	3	26	71
Use of instructional materials	3	9	31	57

- Nearly all participants rated satellite mathematics course instructors positively.

offered suggestions for improving the summer sessions, and specified future staff development needs. Nearly all (N=407) of the 463 questionnaire respondents cited aspects of the summer training they found most useful. Close to half (45 percent) of these respondents mentioned the ideas and strategies provided for presenting the curriculum to students. Other responses included references to networking with colleagues (22 percent) and the instructional and resource materials distributed (17 percent).

Recommendations for improving the summer training were offered by half (N=226) of the questionnaire respondents. The most frequent request, made by 54 percent of those who answered this question, was to extend the length and/or scope of sessions to permit more comprehensive coverage of specific curriculum topics. Of the 328 satellite trainees who commented on future staff development assistance, more than half (58 percent) emphasized the need for practical help in implementing the curriculum -- e.g., ways of developing curriculum ideas, suggestions for teaching special populations, innovative approaches to teaching mathematics, and more materials and manipulatives.

MATHEMATICS AND SCIENCE EQUIPMENT AND SUPPLIES FOR HIGH SCHOOLS

In order to upgrade the quality of mathematics and science instruction in New York City high schools, the Division of Curriculum and Instruction spent approximately $1.1 million for supplies, instructional materials, and new science equipment. These funds were used for the following specific purposes:

- -- to expand the special mathematics and science program at Manhattan Center;
- -- to equip two newly redesigned technology-oriented high schools -- the High School of Telecommunications Arts and Technology and the

Paul Robeson School for Business and Technology (Formerly Bay Ridge High School and Alexander Hamilton High School, respectively);

-- to provide all high schools with textbooks for the new sequential mathematics curriculum;*

-- to increase the number of students served by the Comprehensive Mathematics/Science Program at nine high schools; and

-- to provide all high schools with additional science supplies.

Figure 1 summarizes these expenditures.

CURRICULUM DEVELOPMENT AND DISTRIBUTION

The following newly developed or revised curriculum materials were distributed by the Mathematics Unit during 1985-86:

Second Year Consumer Mathematics

Scope and Content:** Five copies were distributed in September, 1985 to each high school assistant principal of mathematics.

Curriculum Guides: These were distributed to participants of staff development workshops during summer, 1986.

Sequential Mathematics, II

Curriculum Guides: Five copies were distributed to each high school assistant principal of mathematics (Part I in September, 1985 and Part II in February, 1986); to high school and junior high school participants of summer, 1985 staff development workshops (one copy of each volume per participant); and to all math coordinators for distribution to junior high schools (two copies of both Parts I and II per school).

High School Computer Mathematics

Curriculum Guides: Five copies were distributed to each high school assistant principal of mathematics (Part I in September, 1985 and Part II in February, 1986); and copies were given to participants of Consumer Mathematics staff development workshops offered in summer, 1985 and spring, 1986.

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*Because of new Regents Action Plan mandates in mathematics, new textbooks, rather than the standard 20 percent textbook replacement, had to be purchased for all high schools.

**The sequence was not predetermined.

FIGURE 1

Funds Expended During 1985-86 School Year for [a]
High School Mathematics and Science Equipment and Supplies

Program Component	Population Served	Supplies and Equipment Provided	Amount Expended
Manhattan Center	18 additional math classes 13 additional science classes 300 additional pupils	New science equipemnt, math and science supplies, and 7 additional teachers	$364,000
H.S. of Telecommunications Arts and Technology	275 pupils	Instructional supplies, textbooks and equipment	$365,000
Paul Robeson School for Business & Technology	280 pupils	New scientific equipment and new instructional materials for math	$125,000
Sequential Math Curriculum Textbooks	All high schools	New sequential mathematics textbooks	$150,000
Comprehensive Math/Science Program Expansion	3,500 pupils at 9 high schools	Additional supplies & equipment to support program expansion	$ 45,000
Science Supplies	All high schools	Additional science supplies	$ 50,000
TOTAL			$1,099,000

[a] Data presented in this figure is based on information provided by the Office of Budget Operations and Review.

Sequential Mathematics, III

Scope and Sequences: Five copies were distributed in September, 1985 to all high school assistant principals of mathematics.

Curriculum Guides: These were distributed to participants of summer, 1986 staff development workshops.

Elementary Mathematics, Grades 2-4

Scope and Sequences: Part I and II for grade two were distributed to all elementary schools in February, 1986; curriculum changes for grades two to four were given to mathematics coordinators for distribution to teachers in September, 1985 and to participants of summer, 1985 workshops.

SCIENCE STAFF DEVELOPMENT, SUMMER, 1985

At the end of the Science Staff Development Program in August, 1985, questionnaires were distributed to all workshop participants (N=1,350) asking them to assess various aspects of the training they received. Completed questionnaires were returned by 828 respondents (representing a response rate of about 60 percent). Most (79 percent) were teachers; three percent were supervisors; and the rest were assistant principals, staff developers, and laboratory specialists. Over half (54 percent) worked at the intermediate/junior high school level, and nearly equal proportions held elementary and high school level positions (23 and 19 percent, respectively); the remaining four percent reported having other assignments -- e.g., at the district level.

Most (80 percent) of the respondents had seven or more years of teaching experience, whereas less than one-fourth (23 percent) had any supervisory experience.* A majority (72 percent) of all participants considered their science background to be "good or "excellent."

*It should be noted, however, that only two of the science training programs were designed expressly for supervisors.

In assessing the summer workshops, more than 80 percent of the respondents rated the organization, comprehensiveness, and overall quality of the training highly. Participants also rated specific aspects of the workshops they attended. The findings are presented in Table 4. Overall, respondents judged the summer workshop very favorably: more than 90 percent rated the instructor's knowledge of the course content and responsiveness to participants' questions, as well as the quality of the instructional material, to be excellent or good; majorities (89 and 82 percent, respectively) rated the presentation of the subject matter and opportunities for hands-on experiences similarly.

Two other questionnaire items focused on the extent to which the summer, 1985 training was geared to the particular backgrounds and needs of the participants. Close to 90 percent of the respondents said that in light of their previous teaching or supervisory experience and their background in science, the training was moderately to very appropriate and they anticipated, given their respective responsibilities, that the training would be useful.

Finally, since one of the goals of the summer, 1985 staff development program was for participants to pilot the curriculum in which they were trained during the 1985-86 school year and, to the extent possible, to assist their peers in its use, summer trainees were asked about the follow-up activities in which they expected to participate.* About one-fourth of the respondents anticipated that they would pilot a new curriculum (27 percent) and/or teach an in-service science course (22 percent). The largest percentage (41 percent) expected to provide instructional support

*Percentages total more than 100 percent because of multiple responses.

TABLE 4

Trainees' Ratings of Various Aspects of
Summer, 1985 Science Staff Development

Aspect	Rating			
	Poor	Fair	Good	Excellent
Instructor's knowledge of course content	0%	3%	23%	73%
Presentation of subject matter	1	11	39	50
Instructor's responsiveness to participants' questions	0	4	31	65
Quality of instructional materials	1	8	41	51
Opportunities for hands-on experiences	5	14	33	49

- Respondents' ratings of all aspects of summer, 1985 science staff development were positive.

to their colleagues, but on a less formal basis -- e.g., at grade level or faculty conferences. Less than 10 percent indicated that they would engage in some follow-up activity, but did not specify what it would be. Relatively few (11 percent) said "none" in response to this question.

SCIENCE STAFF DEVELOPMENT, SCHOOL YEAR 1985-86

Workshops on New Science Curricula

Approximately 200* school staff participated in workshops and in-service courses conducted in spring, 1986 designed to provide assistance in implementing newly developed science curricula -- the elementary (kindergarten to grade six science program), seventh grade life science, and Regents earth science programs. Questionnaires distributed to all participants at the end of the sessions focused on participants' assessment of the quality and usefulness of the training and their suggestions for future staff development activities.

A total of 136 questionnaires were returned, representing a response rate of 68 percent. Respondents were nearly equally divided with respect to their school levels: about half (45 percent) had elementary assignments and half (54 percent) were from intermediate schools/junior high schools. Most (74 percent) were general education teachers; the rest were special education teachers (14 percent) and other school personnel (12 percent). Whereas about 20 percent had three or fewer years of teaching experience, nearly half (49 percent) of the respondents had been teaching for more than 10 years. Close to three-fifths (57 percent) of those teachers and

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*This figure includes the estimated number of individuals who took an in-service science course because not all instructors provided the registration information requested by the Bureau of Staff Development and Training.

supervisors working at the intermediate/junior high school level had a science license,* but two-thirds of all participants (66 percent) characterized their science background as "fair" or "poor."

Virtually all (more than 95 percent) of the respondents rated the quality of instruction "good" or "excellent" and considered the training both appropriate in view of their background in science and useful, given their teaching or supervisory responsibilities. Ratings of specific aspects of these staff development activities were similarly positive (Table 5).

Less than 27 percent of these respondents said that they expected to participate in any of the required follow-up activities -- e.g., piloting a new curriculum or providing assistance to their peers in "turnkey" fashion. Moreover, when asked if they intended to participate in any follow-up activity other than those listed, some indicated that they hoped to receive additional training (not to provide it to others). These findings suggest that the program's expectation of subsequent involvement on the part of participants in these staff development activities was not adequately communicated by the community school district superintendents.

Of the 99 respondents who answered an open-ended question about the value of the training they received, nearly all (91 percent) cited the practical assistance given in implementing the curriculum, such as useful ideas for teaching process skills, strategies for teaching particular grade levels, and ways of adapting instruction to the needs of special education students. Nearly two-thirds of the respondents mentioned the improvement

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*Licensing for elementary teachers does not require subject area specialization.

TABLE 5

Participants' Assessment of Spring, 1986
Science Staff Development

Aspect	Rating			
	Poor	Fair	Good	Excellent
Instructor's knowledge of course content	0%	1%	20%	79%
Presentation of the subject matter	0	2	27	71
Instructor's responsiveness to participants' questions	0	1	21	78
Quality of instructional materials	0	3	25	72
Opportunity for hands-on experiences	1	5	16	78
Extent to which course objectives were met	0	3	25	72

- Participants rated all aspects of spring, 1986 science staff development activities very positively.

in their basic understanding of science or of the specific curriculum area covered, and the increase in their level of confidence in teaching it.

Suggestions for future training were offered by nearly half (46 percent) of the respondents; 55 percent of these agreed that "more is better." They asked for greater in-depth coverage of topics, the inclusion of additional topics, more or longer sessions, more hands-on laboratory experiences, and more extensive explanations of the scientific theories underlying the laboratory activities demonstrated. (This last request was particularly true of individuals taking workshops in earth science.)

Computer Workshop for High School Science Supervisors

A total of 28 assistant principals and teachers attended a computer workshop designed to acquaint high school science supervisors with public domain and commercially available software, and to assist them in using and evaluating it. Twenty-two participants completed the reaction forms that were distributed at the end of the sessions.

While most respondents (82 percent) reported having a license in science, only about half (54 percent) rated their previous experience with computers positively. However, three-quarters (73 percent) considered the assistance they had received to be appropriately geared to their level of familiarity with computers, and all respondents anticipated that it would be useful in view of their teaching or supervisory responsibilities.

Nearly all of the 22 respondents answered the open-ended questions asking them to identify those aspects of the workshops they found most useful (N=20), and to suggest future computer-related training activities that would be of assistance to high school science supervisors (N=19).

Considered most useful were the following:*

- o chance to become familiar with available software and sources of information about it (N=13);
- o hands-on experiences/learning about computer applications (N=9); and
- o opportunity to copy public domain software (N=6).

The most frequent suggestions for future training were:

- o offer workshops/demonstrations of specific software applications, such as interfacing with video, use in remediation and simulation, and interfacing with laboratory experiments (N=10);
- o provide hands-on experiences (N=8); and
- o extend the length of sessions (N=6).

In response to a question about specific areas in which they would like additional training, two-thirds of the respondents expressed an interest in learning more about Database III and other data base systems, Dialog, spreadsheets, and BASIC programming.

Gateway Environmental Study Center

The following summary of Gateway Center programs and staff development activities is based on an interview with the Center's coordinator and a review of official brochures and other information provided to O.E.A. For the past decade the Gateway Environmental Center has afforded New York City teachers and children a variety of opportunities to better understand and enjoy the world around them. Among the continuing programs and activities are the following:

Day Visits. Class field trips explore upland, beach, marsh, and bay habitats to learn about different species of marine, bird, and plant

*The total number of responses is greater than the number of respondents because of multiple responses.

life. Teachers are required to attend a preparatory workshop, although National Park Service rangers are available as guides.

Camping. Teachers who complete Gateway's two-credit camping leadership program can take their students on an overnight tent camping trip at the Center's Ecology Village. The experience provides instructional opportunities in science, mathematics, communication arts, music, group problem solving, and physical fitness: children plan and prepare meals; learn how to use and care for camping equipment; and explore the environment. Improved observation and recording skills, as well as follow-up exercises in classifying and interpreting field explorations, are among the educational outcomes. (More extended trips, including sites outside New York City, are also available and give students a chance to learn about the interrelationship of rural and urban environments.)

Cornell University Cooperative Extension Workshops. Urban garden horticulturists and other Cornell Staff specialists help teachers to transform their classrooms into living laboratories for the study of plant and animal science, weather, and nutrition. Harvesting pumpkins, learning the art of printmaking, using vegetables, leaves, and fish, and making peanut butter are among the "greening of the classroom" techniques taught.

Springboard to the Arts. Teachers learn how to use the environmental arts to enhance instruction in science, social studies, and communications. Techniques include making masks and models of small creatures, and creating baskets, wall hangings, and other decorative objects from natural and store-bought materials. Optional follow-up class visits to the Gateway Center enable students to discover the interrelationship of art and the environment.

According to Gateway's coordinator, special education teachers in particular find that the Center's experience-based activities provide "special teachable moments" that do not readily exist in the traditional classroom setting.

A notable feature of this environmental study center is the continuing interest and involvement of some public school staff and students who volunteer their time to share the benefits of their experiences with others. A group of teacher alumni (Educators for Gateway), for example, acts as buddies to their colleagues on camping trips; and in one community school district a group of gifted junior high school students serves as guides to younger children during class visits.

During the 1985-86 school year, close to 1,500 public school staff (from 28 community school districts and 11 high schools) attended staff development activities sponsored by Gateway. These included: site orientations; camping; leadership training; marine and plant science workshops; and hands-on environmental arts training.

A total of 16,600 students participated in a wide variety of Gateway activities, including some that were supervised by National Park Service staff, such as escorted field walks for the study of numerous animal and plant habitats and their ecosystems.

Science Coordinators/Laboratory Specialists

In order to determine the nature and extent of the role played in the community school districts by science coordinators and laboratory specialists during the 1985-86 school year, O.E.A. staff conducted telephone interviews with a 33 percent random sample of science coordinators (stratified by borough) and four of the six laboratory specialists (one from each

of the community school districts that used project funds for this position). Questions focused on their science and teaching backgrounds, science-related responsibilities, and other district functions, if any.

Science Coordinators. Of the nine science coordinators interviewed, four had been hired during the 1984-85 school year (when project funds first became available for this position); two were hired during 1985-86. Three respondents indicated that they had been hired as the district science coordinator prior to the 1984-85 school year.* Most of the districts sampled, then, utilized the money made available by the project to establish the position of science coordinator which had not existed in their district previously.

Five of the nine science coordinators interviewed reported that they did not have a license in science,** although all but one did have some graduate and/or undergraduate science training (ranging from 18 to 125 credits). The individual who had no background in science was also the district's director of curriculum and instruction, had more than ten years of supervisory experience, and worked in close collaboration with a junior high school science chairperson in carrying out the functions of science coordinator.

The teaching experience of this sample of science coordinators ranged from eight to 30 years, with an average of 17 years; most (N=7) said that they had previously held an administrative or supervisory position that typically included staff and/or curriculum development responsibilities.

*Prior to the 1984-85 school year, some community school district superintendents filled this position using discretionary funds.

**It should be noted that licensing requirements for elementary level teachers do not include subject area specialization; the four coordinators who reported having a license in science had junior high school positions.

(Based on these findings, the Science Unit has initiated plans to more clearly delineate requirements for the science coordinator position and to review all candidates nominated by the districts for the 1986-87 school year.)

The number of schools for which each coordinator was responsible varied considerably from 16 to 30, with an average of 24. In two districts the position was shared, with one or two people covering the elementary schools and another person working with the junior high schools.*

All but one of the science coordinators said that they devoted time to staff development;** however, the amount of time varied from less than 10 percent to as much as 80 percent depending upon the districts' self-perceived needs. Both district-wide and local school support were provided, although in the case of district-level training, the target population varied. For example, one district focused on the needs of new teachers, whereas another (in which three individuals shared the science coordinator position) developed a district-wide schedule for teaching the kindergarten to grade nine science curriculum and directed their staff development efforts at helping all teachers and supervisors to implement it. Another science coordinator emphasized the need to assist those school staff teaching science out-of-license.

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*Apparently some districts used project monies to hire additional science coordinators.

**The science coordinator not involved in staff development had been hired in April, 1986 and thus had been in the position for only one month at the time of the O.E.A. interview.

On-site staff development was usually ongoing and informally arranged. It included presentations at grade and faculty conferences, demonstration lessons, classroom observations, and individual teacher conferences. Some coordinators, however, assumed a more active role in initiating this on-site support. In one district, for example, the science coordinator identified and trained a group of master teachers who, in turn, gave workshops for their colleagues. Another coordinator, on the other hand, provided assistance primarily in response to school requests.

While few coordinators (N=2) were involved in developing new science curricula, all said that they participated in reviewing and assessing existing materials, sometimes in collaboration with school curriculum committees and/or science supervisors.

Coordinators approached the selection and distribution of science materials differently. In some districts they assumed this responsibility entirely (N=4) or shared it with the schools (N=3). In only two districts was the decision left completely to the schools. In explaining why the district assumed total responsibility for decisions regarding science materials, one coordinator expressed the concern that well-intentioned but out-of-license science teachers might not know what would be most useful and cost effective; another feared that schools might use the funds to purchase non-science materials. A different philosophy was articulated by another coordinator who gave schools advice upon request, but considered school staff competent to make the final decision.

In addition to these staff development and curriculum-related responsibilities, science coordinators were involved in a variety of other activities designed to promote science education. These included:

- serving as liaisons with community resources -- e.g., zoos, botanical gardens, museums, planetariums, Gateway and Wave Hill study centers -- and organizing field visits and camping trips;
- developing special programs such as science skills centers, science clubs, and aquarium hospitals;
- disseminating information about science materials and activities to school staff; and
- coordinating district and school science fairs.

Three of the coordinators interviewed said that they had commitments other than those related to their role as science coordinator; one was also the district's full-time director of curriculum and instruction; another served as the district's curriculum coordinator 50 percent of the time; and the third devoted about ten percent of his time to monitoring tests.

Laboratory Specialists. Four of the six laboratory specialists were interviewed. Only one had been hired prior to the 1984-85 school year when project funds were first available for this position. With respect to their professional background, two were licensed laboratory specialists; one was licensed for more than 30 years as a chemist and had, in addition, master's level science education and teaching experience; the fourth had a temporary per diem high school license, as well as some undergraduate credits in science.

All worked in junior high schools. Three were assigned only to one school, while the fourth divided his time between two. None had responsibilities at the district level.

Setting up and dismantling experiments for teachers took up the greatest proportion of the laboratory specialists' time (estimated by one to be as much as 80 percent). Two reported working directly with students on laboratory projects, while the other two assisted teachers exclusively.

Care and cleaning of equipment, including in some cases plants and animals, was described as an essential component of the laboratory specialists' work. Students sometimes assisted with these tasks, learning how to handle and care for laboratory equipment safely. Other major responsibilities included taking inventory, ordering and organizing science supplies, and conducting safety checks of equipment and chemicals. Some also did minor repairs of equipment.

While none of these science personnel were assigned responsibilities in their district other than those related to their role as laboratory specialist, they provided support to teachers that seemed to go beyond their official duties -- e.g., they gave advice on how to convey science concepts and skills, gave demonstrations lessons in the laboratory, and worked with students on science fair projects. The major explanation offered by the laboratory specialists for this level of involvement was their recognition that many teachers have little or no training in science. (One said there were only two licensed science teachers in his school.)

CURRICULUM DEVELOPMENT AND DISTRIBUTION

Consistent with its commitment to provide instructional materials that incorporate the new curriculum mandates of the Regents Action Plan, the Science Unit distributed scope and sequences for use during the 1985-86 school year in the following curriculum areas: elementary science (to all kindergarten through sixth grade teachers); life science (to all junior high school teachers of grade seven); and Regents earth science (to the 90 junior high school teachers of grade eight expected to teach this course).

COMPUTER SCIENCE

Technical Assistance Centers

Table 6 summarizes the major staff development activities provided by the TACs between July, 1985 and May, 1986. It is based on information supplied by CISU, and refers only to formally scheduled workshops. Other TAC training activities are not included since this information was not systematically categorized or reported by all centers. However, a review of available calendars, telephone logs, and visitors' registers revealed that the TACs sponsored various other supportive activities, such as training for parents, paraprofessionals, and community school board members; discussions with school administrators and teachers about software copyright issues; and conferences with principals to review continuing staff development needs and to explore ways of resolving computer repair problems.

To facilitate the responsiveness of the TACs to the specific needs of their boroughs, each center organized an Advisory Council comprised of key school and community people involved in computer education -- e.g., computer coordinators, principals, high school superintendents' office representatives, and college personnel. Although meetings were to be held monthly, some TAC Advisory Councils met as little as twice during the 1985-86 school year, whereas others reported meeting more than once a month. However, district computer coordinators and the Technology Advisory Council, which consisted of representatives from several bureaus, met monthly at the CISU.

TABLE 6

Staff Development Workshops Provided by Technical Assistance Centers from July, 1985 to May, 1986

TAC	Number of Workshops[a]	Number of Participants[a]
Staten Island	62	815
Queens	72	1,176
Manhattan	136	1,651
Brooklyn	109	2,278
Bronx	202	2,560
TOTAL	581	8,480

[a] Reported here are the number of workshop offerings and participants served; in those instances where TACs reported the total number of workshop sessions and the number of attendees of each, the total number of discrete workshops and individuals trained were estimated.

- The Bronx offered 202 workshops to the greatest number of participants, 2,560.

Conference for Community School Districts

A total of 100 school district personnel attended the computer conference for community school district personnel, although some participated for only one of the two days. Conferees were asked to assess each of the sessions they attended by completing a reaction form that focused on the quality and appropriateness of the presentations in view of their needs and those of their districts. Respondents indicated the extent to which they agreed or disagreed with a series of positive statements about the workshops they attended.

Since the number of sessions attended by each participant varied, not all conferees completed the same number of evaluation forms. However, based on workshop attendance data for the two days, it was estimated that a total of 426 forms could have been completed. Table 7 summarizes the data from 242 reactions forms (representing a response rate of 57 percent). The ratings for all sessions combined* clearly indicate that respondents considered the computer conference overwhelmingly successful: each aspect of the training was rated highly by more than 80 percent of the respondents (84 to 98 percent).

In addition, at the end of the conference, participants were asked to answer several open-ended questions designed to provide information that would be useful for planning future staff development activities. A total of 53 people responded; given the number of people who attended the second day of the conference (N=84), this represents a response rate of 63 percent.

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*It should be noted that no reaction forms were returned for three of the 21 sessions.

TABLE 7

[a]
Respondents' Ratings of Computer Conference
for Community School District Personnel

Aspect	Rating			
	Disagree Strongly	Disagree Somewhat	Agree Somewhat	Agree Strongly
In view of my district responsibility, the content of the workshop was relevant to my needs	3%	5%	27%	66%
The workshop leader was sufficiently knowledgeable about the topic	1	1	17	81
The quality of the instructional material was high	1	8	23	67
The workshop was well organized	1	5	28	66
The presentation was appropriately geared to my level of familiarity with computers	4	4	22	69
The workshops leader was responsive to participants' questions	2	2	25	72
The workshop format was appropriate to the subject matter presented	3	8	22	67
The amount of time allotted was adequate to meet the session's objectives	2	9	30	60
If implemented, the ideas presented would help to meet important educational or administrative needs	2	6	22	70
The workshop presentation encouraged me to think about using computers in new ways	5	10	23	62
The workshop leader paid attention to the concerns of educators	2	3	22	73
The subject matter was presented clearly	2	4	20	74

[a]
Data from 242 evaluation forms were analyzed; this is greater than the total number of conferees because participants attended more than one workshop session.

- Overall, participants agreed that the quality of the computer conference was high and that it was relevant to their needs.

Asked to describe the most useful aspects of the conference, the majority of respondents (57 percent)* referred to the exposure to a wide range of new technologies and stimulating ideas for using computers; about 20 percent specifically mentioned presentations that dealt with classroom applications and ways of integrating computers with subject area instruction. Over two-fifths (42 percent) cited the opportunities for networking: discussing problems, exchanging ideas, learning about successful computer-based programs, and making important contacts with central and district-level staff who would be useful resources in the future.

Suggestions for improving the conference centered on: logistical issues (30 percent), such as extending the length of the conference, repeating some workshops more frequently, and allowing more free time; providing more concrete assistance in maximizing the computer's educational potential (21 percent); and gearing the content of the sessions more specifically to the needs and interests of different educational personnel (17 percent). Among the specific recommendations made were to include videotaped demonstrations of teachers using computers with children, as well as greater involvement of teachers as workshop leaders and panelists. Respondents also suggested videotaping certain workshop presentations for future use in district staff development activities.

Virtually all respondents applauded the decision to hold the conference off-site over an extended period of time. They cited the advantage of being able to immerse themselves in topics of interest without everyday distractions and interruptions, the chance to meet with colleagues in an

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*Percentages reported may exceed 100 percent because of multiple responses.

informal atmosphere conducive to establishing good working relationships, and the professional tone conveyed.

In response to a question asking what additional assistance community school staff needed in using computers to meet their district's educational and administrative needs, close to 70 percent of the respondents referred to staff development. This included the request for on-site training, funds for hiring additional staff development personnel, and more training in the role of computers in education and ways of integrating them for subject area instruction. Other requests included help with technical and logistical issues (21 percent), such as the rapid electrification of rooms and installation of equipment, security for hardware, and repair support; and the provision of software for the administrative use of computers and training in its use (17 percent).

Workshops on Microcomputer Preventive Maintenance and Repair

A total of 241 community school district and high school personnel attended the December, 1985 workshops that dealt with general maintenance of IBM PC and Apple IIC computers.* About half (53 percent) of the participants returned completed questionnaires asking them to assess the quality of the training provided and to suggest ways of improving it.

Nearly all respondents (95 percent) gave the workshop they attended an overall rating of "good" or "excellent." Large majorities (ranging from 87 to 99 percent) of the respondents also agreed with a series of positive statements about specific aspects of the training they received (see Table 8).

*Workshops were also offered in February, 1986 on the Tandy 1000 and Commodore 64 computers; however, no evaluation data were available from CISU for these activities.

TABLE 8

Participants' Assessment of the December, 1985 Computer Preventive Maintenance Workshops

Aspect	Rating			
	Disagree Strongly	Disagree Somewhat	Agree Somewhat	Agree Strongly
The objectives of the workshop were clearly stated	0%	1%	25%	74%
The workshop was related to preventive maintenance	0	2	36	63
The workshop was well organized	0	3	31	66
The presenter was knowledgeable	0	1	25	74
The presenter was effective	0	2	24	74
The materials will be useful for my job assignment	1	5	32	62
The training received in general computer skills was effective	0	2	40	58
This training will help to increase my competency in maintaining selected computer hardware	1	7	40	52
I now know where to locate resources for help with computer-related questions	0	8	40	52

- At least 92 percent of the respondents reacted positively to all aspects of the computer preventive maintenance workshops.

In one open-ended question, approximately three-quarters of the 127 respondents cited what they considered to be the strongest feature of the workshop. The largest proportion (38 percent) of these respondents referred generally to the practical assistance provided in dealing with computer maintenance and installation; others specifically mentioned the hands-on experience (27 percent) and the high caliber of the instructors (19 percent). Fewer respondents (44 percent) suggested ways of improving this staff development activity; those who did, requested greater access to computer equipment (41 percent) and more extensive training (36 percent).

W.E. Grady Computer Repair Center

Since the Grady Center was in operation for only two months this year, O.E.A. limited the scope of its evaluation to observing one class session, and to interviewing the Center's director, computer technician, and several students. O.E.A.'s observer reported that the computer repair room was well organized for small-group instruction: two students were assigned to each work station, which consisted of a personal computer and diagnostic equipment; and the amount of work space was judged to be adequate.

The class session began with the instructor electronically inserting a fault in a disk drive, and engaging the students in a question and answer session to diagnose the problem. Using a troubleshooting flowchart and a printed set of experimental procedures developed by the program director, the students then worked in pairs to determine the location of the fault and to probe the appropriate circuit, while the instructor circulated throughout the room asking questions and making suggestions. The students worked diligently and seemed interested and motivated.

Three of the six students present were interviewed informally. They

were enthusiastic about the program, noting in particular that it was more up-to-date than many other courses they had taken and that it more successfully "connected" theory and hands-on experience. The individualized attention provided was also cited as an important feature. Since convenient access to equipment was considered very important, some concern was voiced about maintaining the current ratio of two students per work station as the program expands.

The program's director emphasized that the course is part of a larger program in computer technology. He added that students who complete it successfully will have sufficient technical knowledge and skills to enable them to qualify for on-the-job training programs in industry.

In its two months of operation, the Center served four Brooklyn MAC/VIP high schools in addition to Grady, and the director estimated that the services provided saved these schools approximately $3,400 in repair costs. (Schools pay only for new parts.) He suggested that in order for the center to function more effectively more information is needed about computer use at other schools, as well as the number and type of equipment breakdowns encountered by the MAC/VIP schools. One major problem this year was that the van that was ordered for the purpose of transporting the computers to and from the Center was not delivered. The technician commented on the Center's need for its own contract for parts to eliminate the time-consuming bidding and to reduce costs; he also suggested that more sophisticated and varied test equipment be made available to students.

According to the program director, the task of developing a computer repair and maintenance curriculum -- consisting of a sequence of topics, student activities, daily lesson plans, and actual repair experiences --

which was begun this year, will continue during 1986-87. In addition, service bulletins outlining step-by-step procedures for simple repair and maintenance problems will continue to be distributed as they are completed. (One was distributed this year.) Eventually these will be compiled into a service repair manual.

One informal measure of the Center's success are letters from computer coordinators of two high schools served by the Grady Center during the few months of its operation in which they expressed appreciation for the timely and efficient service provided in meeting an important need.

Curriculum Development and Distribution

During the 1985-86 school year, the Office of Technology continued to develop and distribute computer education curriculum materials to New York City public school staff. (The Technical Assistance Centers conducted all accompanying staff development.) Table 9 summarizes the computer education materials distributed to community school districts and high schools.

TABLE 9

Computer Education Materials Distributed
During 1985-86 School Year

Title	Number Distributed to: C.S.D.S.	High Schools	Total
Computer Literacy (Elementary)	620	0	620
Computer Literacy (I.S./J.H.S.)	275	0	275
Computer Science I (H.S.)	235	370	605
Computer Science II (H.S.)	225	370	595
Advanced Placement Pascal I (H.S.)	25	375	400
Advanced Placement Pascal II (H.S.)	0	170	170
Apple Tool	400	900	1,300
IBM/Tandy Tool	140	1,150	1,290
Commodore Tool	400	50	450
Preventive Maintenance	640	600	1,240
TOTAL	2,960	3,985	6,945

- Close to seven thousand computer education materials were distributed during 1985-86: 57 percent to high schools and 43 percent to C.S.D.s.

IV. CONCLUSIONS AND RECOMMENDATIONS

The Staff Development Program in Mathematics, Science, and Computer Science successfully achieved its goals. The project effectively:

- o assisted teachers in upgrading their subject area knowledge and instructional skills;
- o offered training in understanding and teaching new curricula;
- o helped administrators and supervisors in providing management and instructional support to other school staff; and
- o provided updated curriculum materials. (All units continued to develop and distribute materials.)

The Mathematics Unit provided summer workshops for over 1,800 participants. Mathematics supervisors, teachers, and special education personnel from all grade levels attended. Training focused on trainees' teaching or supervisory responsibilities regarding specific mathematics curricula. Most participants were expected to engage in some follow-up activity during the school year, such as piloting a new curriculum or providing turnkey training for their peers. The great majority of respondents anticipated that they would be able to put into practice what they had learned.

More than 600 public school elementary and secondary teachers and supervisors, primarily participants of the summer, 1985 workshops, attended spring workshops. Most were teachers. These workshops focused on implementation of new curriculum requirements and practical help for lesson and homework planning, and testing. The great majority felt that the satellite course objectives had been met.

Participants of the summer, 1985 Science Staff Development Program rated the overall quality of the workshops highly. Most respondents anticipated that their training would be useful in meeting their responsi-

bilities during the 1985-86 school year. Nearly half of those responding said that they would pilot the new curriculum presented, or pass along what they had learned by teaching in-service courses or providing staff development to their colleagues in less formal ways.

Approximately 200 elementary and intermediate/junior high school teachers and administrators attended spring workshops and in-service courses. Participants' assessment of the training was overwhelmingly positive. Less than a third of those responding, however, expected to provide follow-up assistance to their peers. Some thought that participation in follow-up activities meant receiving additional training, instead of providing it to others as intended by the program designers.

About 30 assistant principals and teachers attended a computer conference intended to give high school science supervisors assistance in selecting and using public domain and commercially available software for science education. Most respondents considered their training appropriate to their level of experience, and all anticipated that it would be useful in undertaking their school responsibilities.

The Gateway Environmental Study Center proved to be a rich resource for area teachers and students. Nearly 1,500 school staff attended camping activities, orientations, leadership training, and science and environmental workshops. Gateway also provided a wide variety of activities for 16,600 students.

A sample of district science coordinator and laboratory specialists were interviewed. Most coordinators devoted time to staff development and all of those interviewed participated in the review and assessment of existing curriculum materials. All were involved in a wide variety of

additional activities designed to promote science education, such as coordinating science fairs, disseminating information, and serving as liaisons with community resources.

Unlike the coordinators, whose responsibilities were district-wide, the laboratory specialists all worked in junior high schools. They worked with teachers and students on experiments and projects, maintained equipment and other laboratory materials, and gave demonstrations to students.

The five Technical Assistance Centers provided a total of 581 workshops for 8,480 participants during the summer, 1985 and the 1985-86 school year. In addition, the centers provided a variety of other supportive activities related to computers, software, staff development, and computer repair problems.

Additional staff development took place at a two-day computer conference attended by 100 science personnel. Each aspect of the training was rated highly by over 80 percent of those who returned evaluation forms.

Computer maintenance and repair workshops for community school district and high school personnel were held in December, 1985 and February, 1986. These staff development activities addressed general maintenance and repair problems for the four computer hardware systems currently in the schools. Participants rated December, 1985 workshops positively, and praised the practical assistance provided and the quality of the instructors. (O.E.A. did not evaluate the training sessions held in February, 1986.)

The W. E. Grady Computer Repair Program was in operation for two months during spring, 1986. During this period, the pilot program provided computer repair training and instruction in electronics to eight students,

and computer repair service to four high schools in addition to Grady. Also begun was the development of a computer maintenance and repair curriculum. Students interviewed were enthusiastic about the program and said that the training offered was practical and up-to-date.

Based on the evaluation findings, the following recommendations are made:

- When follow-up responsibilities are part of a staff development activity, participants should be apprised of this requirement and commitments secured from school administrators (particularly where they are involved in the selection of participants) to provide the support necessary for the implementation of these responsibilities.
- Assistance should be given to instructors of staff development activities in more effectively using time and pacing the instruction provided.
- Consideration should be given to expanding the summer staff development workshops, particularly to provide for more comprehensive coverage of new curriculum topics and, where appropriate, hands-on experiences.
- Subsequent training should be provided to participants of summer staff development workshops throughout the school year, tailored specifically to their continuing needs.
- Consideration should be given to using videotapes of exemplary sessions to extend the benefits of summer training to those who did not participate in the summer activities.